

Basic Infant Formula Module



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Basic Infant Formula Module

Contents

About This Module	v
Breastfeeding	v
Learning Objectives	vi
 Section A: Infant Formulas	A-1
Nutrient Composition.....	A-1
Standard Milk-Based Formulas.....	A-3
Milk-Based Formulas with Special Characteristics	A-5
Soy-Based Formulas	A-8
Protein Hydrolysate Formulas.....	A-11
Follow-up Formulas.....	A-14
Self-Test Questions	A-15
 Section B: Adverse Food Reactions	B-1
Food Hypersensitivity	B-1
Food Intolerance	B-2
Lactose Intolerance	B-2
Self-Test Questions	B-5
 Section C: Common Questions and Misconceptions	C-1
Constipation.....	C-1
Diarrhea	C-2
Cow's Milk.....	C-3
Goat's Milk.....	C-4
Colic	C-4
Reflux.....	C-5
Family Milk Intolerance.....	C-8
Self-Test Questions	C-9

Tables

A-1	Comparison of Standard Milk-Based Infant Formulas and Breastmilk.....	A-4
A-2	Comparison of Modified Milk-Based Infant Formulas	A-7
A-3	Recipes for Concentrating Standard Infant Formulas	A-8
A-4	Comparison of Soy Protein–Based Infant Formulas and Breastmilk.....	A-9
A-5	Comparison of Protein Hydrolysate Formulas	A-12
A-6	Follow-up Formulas.....	A-14
B-1	Symptoms of Food Allergies.....	B-1
B-2	Differences Between Lactose Intolerance and Milk Allergy	B-4
C-1	Usual Bowel Function in Infants	C-1
C-2	Causes of Constipation in Healthy Infants.....	C-2
C-3	Causes of Diarrhea in Healthy Infants	C-3

Box

	American Academy of Pediatrics Recommendations for the Use of Soy Formulas	A-10
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About This Module

The *Basic Infant Formula Module* is written for WIC professionals who counsel families about feeding their infants. The module was written as a self-paced lesson. There are test questions at the end of each section that target the key concepts. The module can also be used for group training at staff meetings, and later as a reference.

This module is organized into three sections:

- A. “Infant Formulas” provides detailed information on standard infant formulas and variations of the standard formulas. Having information on these formulas will help you learn which formulas are appropriate for different situations.
- B. “Adverse Food Reactions” gives basic information on food allergies (food hypersensitivity) and food intolerance. Understanding why some infants do not tolerate some foods will help you understand the need for different formulas.
- C. “Common Questions and Misconceptions” gives guidance for answering parents’ questions about formula problems. When parents ask questions, you will have accurate and handy information for them.

Breastfeeding

Maternal breastmilk is the ideal source of nutrition for all healthy infants. However, many infants in North America are formula-fed by the age of 2 months. All standard infant formulas are safe and effective alternatives to breastmilk and provide appropriate nutrition for normal growth and development.

Breastmilk

- Breastmilk is the gold standard for feeding infants. Infant formulas are designed to provide nutrients similar to the nutrients contained in breastmilk.

About This Module

- Breastmilk is easier to digest than formula because it contains enzymes that help digest fat, protein, and carbohydrate.
- Breastmilk contains antibodies, which increase an infant's immunity to infections. A manufacturer cannot add antibodies to infant formula.
- The composition of breastmilk changes to meet the specific nutrient needs of each infant as the infant matures.
- Breastfeeding strengthens the infant's facial and oral muscles that are needed later for eating and talking. Drinking from a bottle uses a different set of muscles.

Learning Objectives

After completing the *Basic Infant Formula Module*, the certifying authority (CA) will be able to:

1. Identify the three major nutrients in standard milk-based infant formulas.
2. Name the similarities and differences in the carbohydrate, protein, and fat in breastmilk and standard milk-based infant formulas.
3. Identify the distinguishing characteristics of the following formulas and their indications for use:
 - Enfamil LactoFree LIPIL / Similac Lactose Free Advance
 - Enfamil AR LIPIL
 - Similac PM 60/40
 - Enfamil 24 LIPIL
4. Identify the differences between soy-based and cow's milk-based infant formulas.
5. Identify five conditions when a soy-based formula would be appropriate.
6. Identify four conditions when the routine use of soy-based formulas would not be recommended.
7. Identify five characteristics of protein hydrolysate formula.
8. Describe the use of follow-up formulas.

9. Define the difference between a food allergy and a food intolerance.
10. Identify differences between lactose intolerance and milk-protein allergy.
11. Provide appropriate counseling on the following comments and questions from a parent or caregiver:
 - “The iron in the formula is making my baby constipated.”
 - “Should a baby with diarrhea be taken off regular formula and get lactose- or sucrose-free formula?”
 - “Now that my baby is 6 months old, can I feed him whole cow’s milk?”
 - “Is goat’s milk a good substitute for baby formula?”
 - “Will changing to another formula help my baby’s colic?”
 - “My baby throws up every formula I give her.”
 - “Milk makes me sick if I drink it and the same thing is happening to my baby.”

Nutrient Composition

All infant formulas must meet the requirements of the Infant Formula Act of 1980, which establishes minimum levels for 29 nutrients and maximum levels for nine others. Formulas may vary somewhat in the amount and type of a particular nutrient and still meet the requirements of the Infant Formula Act. Standard infant formulas provide 20 calories per ounce when prepared according to the directions on the label.

Manufacturers of standard infant formulas include:

Mead Johnson Enfamil brand

Nestlé..... Good Start brand

Ross Similac brand

Wyeth Nutritionals Bright Beginnings and
store brands

Note: Store-brand infant formulas are all manufactured by Wyeth Nutritionals, Inc. with nutrient composition identical to that of Bright Beginnings formulas but distributed under various private labels. If a family runs out of formula, a store brand is a high-quality — and far less expensive — substitute for name-brand formulas.

Understanding the major nutrients in infant formulas can help the clinician determine the underlying cause of an adverse reaction to a formula. The major nutrients in infant formulas are:

- Carbohydrate
- Protein
- Fat

Formulas differ in the type of carbohydrate, protein, and fat that they contain. The formulas can also vary depending on their form, i.e., ready-to-use, concentrate, or powder. Lecithin, carrageenan, monoglycerides, and diglycerides are added to liquid concentrate and ready-to-use formulas, acting as **emulsifiers** to prevent separation. Emulsifiers are not added to powdered forms. Powdered formulas are not sterile and should not be given to infants with compromised immune systems unless there is no alternative form.

emulsifiers:
*compounds that hold
fat in water*

Other Nutrients

nucleotides:

*compounds necessary
for building genes*

taurine:

*a vitamin-like
compound made from
amino acids*

fluoride:

*a mineral essential
to tooth and bone
formation that can
be toxic in excess
amounts*

DHA and ARA:

*Special fats important
for healthy infant
growth and visual and
mental development*

Some formulas contain added amounts of **nucleotides**. Nucleotides are the building blocks for DNA and RNA and are present naturally in breastmilk and cow's milk. Nucleotides improve iron absorption, may enhance immune function, and are necessary for energy metabolism. **Taurine**, a vitamin-like compound, is found abundantly in human milk. It is added to all commercial infant formulas, and is needed for development of the brain, nervous system, and retina. Taurine also has an essential role in fat absorption. **Fluoride** is eliminated from infant formulas to prevent excess consumption of this mineral. Most bottled water contains a very small amount of fluoride, or none. Because infants need fluoride after they are 6 months old, it is important to know the fluoride content of the water used to make their formula.

Docosahexaenoic acid (DHA) and arachidonic acid (ARA) are long-chain polyunsaturated fatty acids that are natural components of breastmilk and are being added to infant formulas. Preterm infants have decreased stores of DHA and ARA and are inefficient in producing their own DHA and ARA. Clinical studies have shown that preterm infants fed formula supplemented with DHA and ARA achieve normal growth and improved visual and mental development compared with preterm infants fed formula without DHA and ARA. Some clinical studies have shown that adding DHA and ARA to infant formula also improves the visual and mental development of term infants. Based on the limited information on term infants, formula companies are adding these fatty acids to some of their formulas. The following are names that formula companies are using to indicate that DHA and ARA have been added to their standard formulas:

LIPIL..... Mead Johnson Enfamil products

Advance Ross Similac products

DHA & ARA Nestlé Good Start products

DHA & ARA Wyeth Bright Beginnings and store brands

Standard Milk-Based Formulas

Standard milk-based formulas are the feeding of choice for healthy, term infants who are not breastfed or are partially breastfed. Because breastmilk is the *gold standard* for infants, standard milk-based infant formulas are designed to be similar to breastmilk in nutrient content.

Major brands of milk-based infant formulas include:

- Enfamil with Iron
- Enfamil LIPIL with Iron
- Good Start Essentials
- Similac with Iron
- Similac Advance with Iron
- Bright Beginnings DHA Formula
- store-brand infant formulas

Carbohydrate

Lactose is the major carbohydrate (sugar) in breastmilk and in standard milk-based infant formulas. Lactose is found only in mammalian milks, such as those of cows, goats, and humans. Milk-based formula is derived from cow's milk, which has a lower lactose content than does human milk. Additional lactose is added during the manufacturing process to bring the amount closer to that of human milk.

Lactose is beneficial to infants because:

- It helps with absorption of minerals, such as calcium, magnesium, and zinc.
- Lactose ferments in the intestine and promotes the growth of good bacteria. These good bacteria produce an acidic environment, which suppresses the growth of bacteria that can cause disease.

Protein

The protein in standard milk-based infant formulas is derived from cow's-milk protein, which has been modified to be closer to breastmilk protein. Milk contains two major classes of protein: **casein** and **whey**. Cow's milk contains about 80 percent casein and 20 percent whey. Breastmilk is 60 to 80 percent whey and 20 to 40 percent casein. Casein forms larger curds in the infant's stomach than whey protein;

lactose:
the sugar in the milk of mammals

casein:
proteins in milk that form curds in the stomach, which are difficult to digest

whey:
proteins in milk that are easy to digest

Section A

lactalbumin:

the major protein in human-milk whey

lactoglobulin:

the major protein in cow's-milk whey

these are harder to digest. Whey-predominant formulas have been developed to provide a protein composition more like that of human milk by combining nonfat cow's milk with demineralized whey to increase the amount of whey. Although this produces a formula that forms smaller curds in the stomach, the whey proteins in breastmilk are very different from the whey proteins in cow's milk. **Lactalbumin** is the major whey protein of breastmilk, while **lactoglobulin** is the major whey protein of cow's milk. Lactoglobulin has more potential for causing protein allergy. Goat's milk also contains lactoglobulin, which makes it a poor substitute milk for infants with an allergy to cow's-milk protein.

Fat

When making milk-based infant formula, the manufacturer removes the butterfat, which is hard to digest, and replaces it with vegetable oils, which are easier to digest. Vegetable oils are added in a specific ratio, to get a fatty-acid pattern closer to human milk fat. **Table A-1** lists the different fats used in standard milk-based infant formulas.

Table A-1 *Comparison of Standard Milk-Based Infant Formulas and Breastmilk*

	Enfamil, Enfamil LIPIIL	Good Start Essentials	Similac, Similac Advance	Bright Beginnings, store brands	Breastmilk (mature)
Protein	Reduced-mineral whey, nonfat milk	Reduced-mineral whey, nonfat milk	Nonfat milk, whey-protein concentrate	Nonfat milk, whey-protein concentrate	Human milk
Whey : casein	60 : 40	60 : 40	52 : 48	60 : 40	80 : 20
% of calories	9%	9%	8%	9%	6%
Fat	Palm olein; soy, coconut, and high-oleic sunflower oils	Palm olein; soy, coconut, and high-oleic safflower oils	High-oleic safflower, coconut, and soy oils	Palm oil–palm olein; high-oleic safflower or sunflower, coconut, and soy oils	Human milk fat
% of calories	48%	46%	49%	48%	52%
Carbohydrate	Lactose	Lactose	Lactose	Lactose	Lactose
% of calories	44%	45%	43%	43%	42%

Milk-Based Formulas with Special Characteristics

There are several milk-based infant formulas that are *modified to meet specific needs*:

- Good Start Supreme & Good Start Supreme DHA & ARA*
- Enfamil AR LIPIL
- Enfamil LactoFree LIPIL
- Similac Lactose Free Advance
- Similac PM 60/40
- Enfamil 24 LIPIL with Iron

Enfamil AR LIPIL

Enfamil AR LIPIL is a milk-based infant formula in which rice starch replaces part of the carbohydrate. This formula is slightly thicker than regular Enfamil when prepared. The formula becomes much thicker than regular Enfamil when it reaches the stomach and mixes with stomach acid. Physicians sometimes prescribe thickened breastmilk or formula as a first-line treatment for infants with **gastroesophageal reflux**. (For more information on GER, see Section C.) Traditionally, formula or breastmilk has been thickened with a measured amount of rice cereal. A pre-thickened formula flows more easily through a nipple without clogging the nipple, while using rice cereal as a thickener allows adjustments in thickness to meet the needs of the individual infant. Adding rice cereal to formula may be a better option in infants taking acid-suppression medication to treat their reflux. Without stomach acid, Enfamil AR LIPIL may not thicken.

The rice starch in Enfamil AR LIPIL replaces part of the lactose, making a formula that continues to have the same calories and a similar proportion of fat, carbohydrate, and protein as standard milk-based formulas. Adding rice cereal to formula increases the calories and changes the proportion of nutrients that the formula provides. The casein-to-whey

gastroesophageal reflux (GER):
a condition in which acidic content from the stomach backs up into the esophagus

* Good Start Supreme formulas are described with the protein hydrolysate formulas.

Section A

ratio of Enfamil AR LIPIL is different from that of standard infant formula but the same as that of cow's milk. *Enfamil AR LIPIL should not be fed to infants born premature who currently weigh less than seven pounds.*

Similac PM 60/40

Similac PM 60/40 is a low-iron infant formula designed for infants who would benefit from a diet lower in sodium, calcium, phosphorus, other minerals, and electrolytes. *PM 60/40* indicates that the protein has been modified to 60 percent whey and 40 percent casein. It contains 66 percent of the phosphorus and 75 percent of the calcium and potassium of standard infant formulas. This formula can be used for infants with heart or kidney dysfunction, hypocalcemia, or other conditions requiring a lowered mineral intake.

Enfamil LactoFree LIPIL and Similac Lactose Free Advance

Enfamil LactoFree LIPIL and Similac Lactose Free Advance are milk-based infant formulas that contain glucose polymers instead of lactose as the carbohydrate source. When an infant shows a negative reaction to a standard infant formula, it is not always clear which ingredient is causing the reaction. The symptoms of lactose intolerance are very similar to symptoms of milk allergy. Gassiness, bloating, frequent loose stools, and a reddened diaper area can be symptoms of either food allergy or lactose intolerance. The carbohydrate in these formulas is changed while the protein remains milk-based. If an infant with symptoms responds well to one of these two formulas, that is an indication that the infant is intolerant of lactose and not the protein in the formula. Enfamil LactoFree LIPIL and Similac Lactose Free Advance have different whey-to-casein ratios from the ratios in standard infant formulas. Similac Lactose Free Advance does not have palm olein as a fat, while Enfamil LactoFree LIPIL does (see **Table A-2**).

Table A-2 Comparison of Modified Milk-Based Infant Formulas

	Enfamil AR LIPIL	Enfamil LactoFree LIPIL	Similac Lactose-Free Advance	Similac PM 60/40
Protein	Nonfat milk	Milk-protein isolate	Milk-protein isolate	Whey-protein concentrate, sodium caseinate
Whey : casein	18 : 82	18 : 82	18 : 82	60 : 40
% of calories	10%	9%	9%	9%
Fat	Palm olein; soy, coconut, and high-oleic sunflower oils	Palm olein; soy, coconut, and high-oleic sunflower oils	High-oleic safflower, coconut, and soy oils	Corn, coconut, and soy oils
% of calories	46%	49%	49%	50%
Carbohydrate	Lactose, rice starch, maltodextrin	Corn-syrup solids	Maltodextrin, sucrose	Lactose
% of calories	44%	42%	43%	41%

Enfamil 24 LIPIL

Calorie content is the major difference between Enfamil 24 LIPIL and the standard Enfamil infant formulas. Enfamil 24 LIPIL is concentrated to give four more calories per fluid ounce than standard formula, and a higher protein and mineral content. Enfamil 24 LIPIL would typically be prescribed for infants who have:

1. increased calorie requirements due to congenital heart disease or bronchopulmonary dysplasia, or for catch-up growth for failure to thrive, or
2. conditions in which the total volume of formula needs to be restricted, as with certain heart conditions or gastroesophageal reflux, or
3. physical barriers to consuming adequate amounts of formula, as with cleft palate or oral-motor feeding problems.

Enfamil 24 LIPIL is only available in ready-to-use hospital bottles (nursing bottles). The same calorie levels can be prepared in the home using liquid concentrate or powdered Enfamil LIPIL according to the recipes shown in **Table A-3**.

Table A-3 Recipes for Concentrating Infant Formulas

Calories/ounce	Formula	Water	Total amount of prepared formula
22	13 oz. concentrate (1 can)	10½ oz.	23½ oz.
	1 level cup powder	26 oz. (3¼ cups)	29 oz.
	3 level scoops powder	⅔ cup	6 oz.
24	13 oz. concentrate (1 can)	8½ oz.	21½ oz.
	1 level cup powder	24 oz.	27 oz.
	3 level scoops powder	5 oz.	5½ oz.

Parent handouts on concentrating formula can also be found online at the WIC Web site, <http://www.dshs.state.tx.us/wichd/nut/concent.htm>.

Note: WIC staff should *never* tell a parent to concentrate formula unless prescribed by the child's physician.

Soy-Based Formulas

Brands of soy formulas include:

- Good Start Supreme Soy DHA & ARA*
- Isomil and Isomil Advance
- Isomil DF
- ProSobee and ProSobee LIPIL
- Bright Beginnings Soy
- store-brand soy formulas

Soy-based infant formulas (soy formulas) contain soy protein rather than milk protein. Soy formulas have been used since 1909 for infants with intolerance to milk-based

* Good Start Supreme formulas are described with the protein hydrolysate formulas.

feeding. The American Academy of Pediatrics Committee on Nutrition revised its recommendations for the use of soy formulas in infant feeding in 1998 (see **box**, following page).

Composition

Soy formulas are all free of cow's-milk protein and lactose. The protein is **soy-protein isolate** with **methionine** added to improve the biological quality of the protein. **Carnitine** and taurine are added in amounts equal to those found in breastmilk. The fat content of soy formulas is derived from vegetable oils. The carbohydrate of soy formula is lactose free; its content varies depending on the manufacturer. The fats and carbohydrates used in soy formulas are listed in **Table A-4**.

soy-protein isolate:
the protein portion of soy without the carbohydrate, or fat content, of natural soy products

methionine:
an essential amino acid necessary for making various body chemicals

carnitine:
a vitamin-like compound found in a few plant foods, but important for energy production and removing potentially toxic compounds

Table A-4 Comparison of Soy Protein-Based Infant Formulas and Breastmilk

	Good Start Essentials Soy	Isomil, Isomil Advance	Isomil DF	ProSobee, ProSobee LIPIL	Bright Beginnings Soy, store- brand soy
Protein	Soy-protein isolate	Soy-protein isolate	Soy-protein isolate	Soy-protein isolate	Soy-protein isolate
% of calories	10%	10%	11%	10%	11%
Fat	Palm olein; soy, coconut, and high-oleic sunflower oils	High-oleic safflower, coconut, and soy oils	Soy, coconut oils	Palm olein; soy, high-oleic sunflower, and coconut oils	Palm oil–palm olein; high-oleic safflower or sunflower, coconut, and soy oils
		49%			
% of calories	45%	Corn-syrup solids, sucrose	49%	48%	48%
Carbohydrate	Corn maltodextrins, sucrose		Corn-syrup solids, sucrose	Corn-syrup solids	Corn-syrup solids, sucrose
	45%	41%	40%	42%	
% of calories					41%

American Academy of Pediatrics Recommendations for the Use of Soy Formulas

Soy formulas are recommended for infants with the following conditions:

- ***Galactosemia***, a hereditary condition in which strict elimination of dietary galactose is required. Soy formulas do not contain lactose, which breaks down to glucose and galactose.
- ***Congenital lactase deficiency***, a condition in which the infant is born without the enzyme required to break down and digest lactose. This condition is extremely rare, with only 50 cases reported worldwide.
- Documented ***transient lactase deficiency*** caused by an acute bacterial or viral intestinal-tract infection. Most healthy infants who are not dehydrated can be fed with breastmilk or a standard milk-based infant formula while recovering from an intestinal-tract infection.
- Documented ***IgE-mediated allergy to milk protein*** (but not for infants with intestinal damage caused by cow's-milk protein — see below).
- ***Vegetarian diet*** for a term infant.

Soy formulas are not recommended for infants with the following conditions:

- Infants with documented ***intestinal damage due to milk allergy*** (enteropathy or enterocolitis) frequently are equally sensitive to soy protein and should not be given soy formula routinely. They should be provided with formula derived from hydrolyzed protein (Nutramigen LIPIL, Pregestimil, or Alimentum Advance), or synthetic amino acids (Neocate or Elecare).
- Soy-protein formulas are not designed or recommended for ***premature infants*** who weigh less than 1800 g (4 lbs.). Premature infants fed soy-based formula exhibit poorer weight gain and lower protein and mineral stores than premature infants fed milk-based infant formula.

The position of the American Academy of Pediatrics is that soy formulas have no advantage in preventing food allergies over milk-based formulas as a supplement for the breastfed infant. The routine use of soy formulas has no proven value in the prevention or management of **colic**.

colic:
*periodic inconsolable
crying in a healthy
young infant,
associated with sharp
abdominal pain*

ISOMIL DF

Isomil DF is a soy-based formula designed to treat diarrhea due to gastrointestinal virus or infection or to antibiotic use. It contains added dietary fiber (soy) specifically for diarrhea management. This formula should not be used for more than 10 days.

Protein Hydrolysate Formulas

Casein hydrolysate formulas include:

- Alimentum Advance
- Nutramigen LIPIL
- Pregestimil

Whey hydrolysate formulas:

- Good Start Supreme and Good Start Supreme DHA & ARA
- Good Start 2 Supreme DHA & ARA

Soy hydrolysate formula:

- Good Start Supreme Soy DHA & ARA

Several milk-based formulas have been modified to make them more digestible. These modifications include the use of hydrolyzed casein or hydrolyzed whey. **Hydrolysis** is the process by which proteins are broken down by enzymes using water to produce smaller protein particles called peptides and free **amino acids**. The longer the enzymes stay in contact with the protein during hydrolysis, the smaller the particles become. Because the protein particles are small, they are easy to digest and absorb. When they are totally hydrolyzed there is less chance of allergic reactions. There is no evidence to support the use of hydrolysates in the treatment of colic, sleeplessness, or irritability.

Although the protein content of all casein hydrolysate formulas is similar, the carbohydrate and fat are quite different, which affects their use. (See **Table A-5**.)

hydrolysis:

an enzymatic reaction in which a compound is broken down by adding water

amino acids:

the building blocks of proteins

Table A-5 Comparison of Protein Hydrolysate Formulas

	Alimentum Advance	Good Start Supreme and Supreme DHA & ARA	Good Start Supreme Soy DHA & ARA	Nutramigen LIPIL	Pregestimil RTU and powder
Protein	Casein hydrolysate, amino acids	100% partially hydrolyzed whey	Hydrolyzed soy-protein isolate	Casein hydrolysate, amino acids	Casein hydrolysate, amino acids
% of calories	11%	9%	10%	11%	11%
Fat	MCT oil (50%); high-oleic safflower, coconut, and soy oils; DHA/ARA	Palm olein; soy, coconut, and high-oleic safflower oils; DHA/ARA	Palm olein; soy, coconut, and high-oleic safflower or sunflower oils; DHA/ARA	Palm olein; soy, coconut, and high-oleic sunflower oils; DHA/ARA	MCT oil (55%); high-oleic safflower, coconut, and soy oils
% of calories	48%	46%	46%	48%	49%
Carbohydrate	Sucrose, modified tapioca starch (corn maltodextrin only in powder form)	Lactose, maltodextrin	Corn maltodextrin	Corn-syrup solids, modified cornstarch	Corn-syrup solids, dextrose, modified cornstarch
% of calories	41%	45%	44%	41%	43%
Possible uses	Milk and soy allergies Fat malabsorption, corn sensitivity (RTU only)	Milk intolerance but not milk allergy or lactose intolerance	Milk allergy, lactose intolerance, galactosemia	Milk and soy allergies	Lactose intolerance with milk and soy allergies; sucrose intolerance; fat malabsorption

Protein

The protein in milk-based hydrolysate formulas is either casein or whey protein. The casein hydrolysate formulas are supplemented with three amino acids — cystine, tyrosine, and tryptophan — to provide a complete balance of protein. There have been cases of allergic reactions to casein hydrolysate formulas, but they are extremely rare. Because the whey protein in the Good Start Supreme formulas is only partially hydrolyzed, it has larger protein particles than those in casein hydrolysate formulas. These formulas taste better because they do not contain the free amino acids present in casein hydrolysate formulas. These formulas are not **hypoallergenic**, so *an infant who has had an allergic reaction to milk protein should not be fed the Good Start Supreme formulas*. There have been published case reports of infants

hypoallergenic:
not likely to cause an allergic reaction

experiencing allergic reactions when fed small amounts of whey hydrolysate formulas.

Note: Good Start Essentials does not have partially hydrolyzed whey protein. It has the same whey and casein proteins as in the standard milk-based infant formulas. See Table A-1.

Good Start Supreme Soy DHA & ARA has partially hydrolyzed soy protein to make it easier to digest. It provides nutrition comparable to that of the other standard soy-based formulas.

Fat

Medium-chain triglycerides (as MCT oil) are the major fat source in Pregestimil and Alimentum Advance. “Medium-chain” refers to the length of the fat molecule. Medium-chain fats are easier to digest and absorb than fats with greater chain lengths (corn, soy, or safflower oils). Infants and children who have a hard time digesting and absorbing fats in foods may benefit from MCT oil. Examples of conditions associated with fat malabsorption include biliary atresia, liver disease, short-bowel syndrome, AIDS (with gastrointestinal involvement), and cystic fibrosis (with gastrointestinal involvement).

Most infants with allergies to milk and soy may not have fat malabsorption and would do fine on Nutramigen LIPIL. The Good Start Supreme formulas contain similar fats to those in Nutramigen LIPIL.

medium-chain triglyceride:
a fat having a molecule of medium length, which is more easily digested than fats with larger molecules; found in formulas as MCT oil

Carbohydrate

Nutramigen LIPIL, Pregestimil, and Alimentum Advance are lactose free. Alimentum Advance in the ready-to-use (RTU) form is the only hydrolysate formula with a corn-free carbohydrate, so it can be used for infants with milk-protein and soy-protein allergies who are also sensitive to corn. Alimentum Advance is the only casein hydrolysate formula that contains sucrose as one of its carbohydrates. (Sucrose may taste better and be better accepted by infants who do not like the taste of casein hydrolysate formulas.) Alimentum Advance should not be given to an infant with sucrose intolerance. Good Start Supreme formulas all contain lactose, so they should not be used for infants who are lactose intolerant.

Follow-up Formulas

Milk-based

Bright Beginnings 2
and store brands labeled “2”

Good Start 2 Essentials

Next Step LIPIL

Similac 2 Advance

Soy-based

Good Start 2 Essentials Soy

Next Step ProSobee LIPIL

Isomil 2 Advance

Follow-up formulas (**Table A-6**) are designed for infants who are at least 4 months of age and are eating their first solid foods. Infants have increased needs for both calcium and protein at the same age that they start eating solid foods. When solid foods are added to an infant’s diet, the infant often decreases the amount of formula he drinks. Follow-up formulas, ounce for ounce, are higher in calcium than standard milk-based or soy-based formulas. Some follow-up formulas also have larger amounts of protein than either breastmilk or standard formulas. Follow-up formulas are available with either milk protein or soy protein.

Table A-6 *Follow-up Formulas*

	Good Start 2 Essentials	Enfamil Next Step LIPIL	Similac 2 Advance	Good Start 2 Essentials Soy	Enfamil Next Step ProSobee LIPIL	Similac Isomil 2 Advance
Protein	Nonfat dry milk	Nonfat milk	Nonfat milk, whey protein concentrate	Soy-protein isolate	Soy-protein isolate	Soy-protein isolate, L-methionine
Whey: casein	18:82	18:82	52:48	NA	NA	NA
% of calories	10%	10%	8%	12%	13%	10%
Fat	Palm olein, soy, coconut, and high oleic safflower oils	Palm olein, soy, coconut, and high oleic sunflower oils	High-oleic safflower, soy, and coconut oils	Palm olein, soy, coconut, and high oleic safflower oils	Palm olein, soy, coconut, and high oleic sunflower oils	High-oleic safflower, coconut, and soy oils
% of calories	37%	48%	49%	48%	48%	49%
Carbohydrate	Corn-syrup solids, lactose	Corn-syrup solids, lactose	Lactose	Corn maltodextrin, sucrose	Corn-syrup solids, lactose	Corn-syrup solids, lactose
% of calories	53%	42%	43%	48%	43%	41%

Self-Test Questions — Section A: Infant Formulas

1. *Fill in the blank.* Standard milk-based infant formulas are designed to be as close as possible to _____.
2. *Fill in the blanks.* Standard milk-based infant formulas have differences in which two major nutrients?
_____ and _____
3. *Fill in the blanks.* In standard milk-based infant formulas, the carbohydrate is _____, the fat is _____, and the proteins are _____ and _____.
4. What is the difference between name-brand infant formulas and store-brand infant formulas?
5. *Fill in the blanks.* What is the recipe for concentrating infant formulas to make a formula with 24 calories per ounce?

Using liquid concentrate:

_____ ounces concentrate with _____ ounces water makes _____ ounces of formula.

Using powdered formula:

_____ cup(s) powder with _____ ounces water makes _____ ounces of formula.

Using powdered formula for one bottle:

_____ scoop(s) powder with _____ ounces water makes _____ ounces of formula.

6. The following formulas are all made from cow's milk but have special characteristics. *Fill in the blank* under the name of each formula with the letter for its characteristic and the number for its appropriate use.

Formulas	Characteristics	Uses
Enfamil LactoFree LIPIL and Similac Lactose Free Advance Characteristic: _____ Use: _____	A Rice starch has been added to thicken the formula when it gets to a baby's stomach B Standard cow's milk-based infant formula with 4 extra calories per fluid ounce C Has cow's-milk protein and no cow's-milk carbohydrate (lactose) D Has lower amounts of sodium, calcium, phosphorus, other minerals, and electrolytes	1 Distinguishing lactose intolerance from milk allergy 2 For infants with heart or kidney dysfunction, hypocalcemia, or hypercalcemia 3 When extra calories are needed or the total amount of formula or fluid needs to be restricted 4 For infants with excessive spitting up
Enfamil AR LIPIL Characteristic: _____ Use: _____		
Similac PM 60/40 Characteristic: _____ Use: _____		
Enfamil 24 Characteristic: _____ Use: _____		

7. *Fill in the blanks.* Soy formulas do not contain cow's-milk _____ or _____.

8. Using the recommendations made by the American Academy of Pediatrics Committee on Nutrition, *write R* by the conditions which are recommended uses of soy formulas, and *write NR* by the conditions for which the use of soy formulas is not recommended.

_____ galactosemia

_____ lactose intolerance

_____ colic prevention or management

_____ preventing food allergies in a breastfed infant

- _____ documented IgE-mediated allergy to cow's-milk protein
- _____ preterm infants
- _____ vegetarian-based diet
- _____ hereditary lactase deficiency

9. Mark the following statements **TRUE** or **FALSE**.

- _____ Casein hydrolysate formulas are less allergenic than standard formulas.
- _____ Hydrolysis is the process that makes whey and casein into larger protein particles.
- _____ A smaller protein particle is easier to digest and absorb.
- _____ Protein hydrolysate formulas work well in treating colic.
- _____ There is less chance of an allergic reaction from small protein particles.
- _____ The "MCT" in *MCT oil* stands for "modified cellulose triglycerides."
- _____ Pregestimil, Nutramigen, and Alimentum are whey hydrolysate formulas.
- _____ All casein hydrolysate formulas are lactose-free and corn-free.
- _____ Medium-chain triglycerides are easier to digest and absorb than fats with longer-chain triglycerides.
- _____ Good Start Essentials is a whey hydrolysate formula that is relatively easy to digest, but it is not hypoallergenic.

10. To complete the following statements, *circle all the letters that apply*.

Compared with standard infant formulas, most follow up formulas contain more:

- a. calcium
- b. protein

c. calories

d. vitamins

Follow-up formulas are appropriate for infants who:

___ e. are eating solid foods

___ f. are at least 4 months old

___ g. are not eating solid foods

___ h. don't like other formulas

Follow-up formulas are made with:

___ i. soy protein

___ j. milk protein

___ k. egg protein

Adverse Food Reactions

Section B

An adverse food reaction is any negative physical reaction

caused by eating a food. Adverse food reactions can be divided into two main groups: **food hypersensitivity** (also known as *food allergy*), and **food intolerance**.

Food Hypersensitivity

Food hypersensitivity is an immune reaction to the protein in a food or to a food additive. When the body recognizes that a specific substance is a threat, it produces IgE antibodies to fight the threat. True allergic reactions to food are estimated to occur in only 0.3 percent to 7.5 percent of young children.

Eight foods cause 90 percent of all allergic reactions: milk, eggs, peanuts, fish, shellfish, soy, wheat, and tree nuts such as walnuts, pecans, almonds, and cashews. A child will usually outgrow allergic reactions to the protein in eggs or cow's milk by age 5.

Most food-allergy reactions happen within a few minutes to two hours after the food is eaten. Other reactions may be delayed up to 48 hours after eating the allergy-causing food. Symptoms vary tremendously between different people (see **Table B-1**.) Differences can include which type of symptoms appear, where they appear, how severe they are, the amount of time from when the food is eaten to when the symptoms are seen, and the amount of food that triggers the reaction.

Anaphylactic reaction is the most severe allergic response. It occurs when the whole body becomes overwhelmed with the response to an allergen. Even though *rare*, it is the most

food hypersensitivity:
a negative food
reaction involving the
immune system; food
allergy

food intolerance:
a negative food
reaction not involving
the immune system

Table B-1 *Symptoms of Food Allergies*

Intestinal	Skin	Respiratory	Systemic
abdominal pain	hives	sneezing	anaphylaxis
nausea	rashes	congestion	failure to thrive
vomiting	eczema — a crusty, scaly skin condition	chronic coughing without an infection	
diarrhea	swelling of lips, tongue, throat, or face	asthma	
bloating			
gas			

Section B

anaphylactic reaction:
*a rare, but severe,
allergic response that
can be fatal*

severe and dangerous reaction to an allergy, and can result in death if not treated *immediately*. Symptoms of anaphylactic reaction include difficulty in breathing; dizziness; swelling of lips, tongue, throat, face, and skin; uneven heartbeat; changes in blood pressure; and shock. The foods that are most likely to cause an anaphylactic reaction include peanuts, shellfish, eggs, and tree nuts. Once the food is identified, that food should *never* be given to the child; and the child should *always* have the appropriate medicine available immediately to treat the symptoms.

Food Intolerance

Food intolerance differs from a food allergy (hypersensitivity) in that it is an abnormal reaction to an ingested food but is not caused by an immunologic response. There are three types of food intolerance:

- ***Pharmacologic reaction*** is the body's response to a natural or added chemical that produces an effect resembling that of a drug. Examples of natural chemicals include alkaloids in mushrooms, goitrogens in cabbage, pressor amines in bananas, and caffeine in tea or coffee.
- ***Food toxicity*** is a reaction caused by toxins contained in the food or released by microorganisms that contaminate the food. Aflatoxin, mercury, and pesticides are chemicals that are toxic to everyone. Food poisoning by *Salmonella* would also fall into this category.
- ***Metabolic reactions*** result from the body's inability to metabolize certain components of food. Lactose intolerance is one of the most common food intolerances.

Lactose Intolerance

Lactose is the sugar in most animals' milk, including human breastmilk. Lactose enhances the absorption of a number of minerals including calcium, magnesium, and zinc.

Lactase is the enzyme that is naturally present in the intestine. The only purpose of lactase is to break down lactose so that it can be digested. Full-term infants are able to digest lactose. Lactase activity can be very low in premature infants, since lactase does not reach a peak until 34 to 38 weeks' gestation.

lactase:
*the digestive enzyme
produced by the body
to break down lactose*

There are three kinds of **lactose intolerance**:

1. Congenital lactase deficiency is an extremely rare genetic condition that exists when lactase is very low or absent at birth.
2. Secondary lactase deficiency is defined as *temporarily* low amounts of lactase as a result of:
 - an intestinal infection or virus,
 - certain antibiotics, or
 - a physical condition that affects the cells lining the intestine.

Secondary lactase deficiency is not uncommon in infants and young children who are susceptible to intestinal viruses.

3. Adult (or late-onset) lactase deficiency is a genetic condition that does not occur in infants but is more common in adults and older children. Approximately 15 percent of white adults, 81 percent of African-American adults, and 100 percent of Asian adults are lactase deficient.

Infectious diarrhea that comes on very suddenly can cause temporary injury to the areas of the intestine where lactase is made. When intestinal injury happens, the first enzyme to be affected and the last to recover completely is lactase.

For a person with lactose intolerance, severe watery diarrhea can be caused by a relatively small amount of lactose when the undigested lactose actually acts as a kind of laxative.

Most infants recovering from an acute episode of diarrhea do not need to be on a lactose-restricted diet. After initial **rehydration**, most infants can be continued on breastmilk or standard infant formula. If diarrhea persists, then a lactose-free formula such as a soy formula or a lactose-free cow's milk-based formula can be used until the diarrhea resolves. Infants who are on a mixed diet of solid foods with formula or with breastmilk sometimes have diarrhea of shorter duration because they are exposed to less lactose than babies who are consuming only breastmilk or standard infant formula. (See **Table B-2**.)

lactose intolerance:
a negative reaction to milk sugar caused by an inadequate amount of lactase production

rehydration:
restoring the fluid lost from a body due to diarrhea or vomiting

Section B

Table B-2 Differences Between Lactose Intolerance and Milk Allergy

		Milk-protein allergy
Cause	Reaction after intake of too much lactose in relation to the body's ability to break it down by the enzyme lactase	Immune response to one or more cow's-milk proteins; immaturity of infants' digestive and immune processes likely contributes to this condition
When does it start?	After intestinal lining is injured by severe infection, medication, or disease	Infancy and early childhood; very rare, especially in adults
How common is it?	Unknown, but considered over-diagnosed	Rare: 0.3–7.5 percent of children
Possible symptoms	Gas, abdominal bloating, pain (cramps), diarrhea	Variable and broad: intestinal, skin, respiratory (see Table B-1)
	Temporary, depending on how bad the intestinal damage was and if the infant was dehydrated	
Outlook		Usually outgrown by age 5
Management	<p>Infants: Usually can be continued on breastmilk or milk-based formula; may need a lactose-free formula temporarily until symptoms resolve</p> <p>Children: Limited amounts of milk and milk products can be included in the diet. Drink small amounts of milk; drink milk with food or meals; eat yogurt with active cultures and most cheeses; try lactose-reduced milk (Lactaid milk or Dairy Ease) and lactase enzyme preparations</p>	Strict avoidance of cow's milk and cow's-milk protein may be needed

Self-Test Questions — Section B: Adverse Food Reactions

1. Mark the following statements **TRUE** or **FALSE**.

The terms “milk allergy” and “lactose intolerance” have the same meaning.

Allergic reactions to foods usually happen within four hours after the food is eaten but may be delayed as much as three days after eating.

Symptoms of food allergy can include nausea, vomiting, diarrhea, congestion, eczema, and swelling of the throat, face, and lips.

An anaphylactic reaction is a whole-body response to an allergen. Symptoms can include an irregular heartbeat, changes in blood pressure, shock, and even death if not treated promptly.

___Inability to digest a food due to a lack of a particular enzyme is an example of a food intolerance.

___Congenital lactose intolerance is fairly common in infancy.

___Most infants recovering from diarrhea should be on a lactose-restricted diet.

2. *Circle* the foods most likely to cause an anaphylactic reaction in susceptible persons.

peanuts shrimp onions eggs cashews bananas

3. Indicate whether the following descriptions relate to a *food allergy* (**A**), a *food intolerance* (**I**), or *both* (**B**) by placing the appropriate letter in the blank.

_____Diarrhea

_____ Occurs in 0.3-7.5 percent of children

_____ Respiratory symptoms

____ Strict avoidance of the offending food may be needed

_____ Skin rash

_____ Involves the immune system

_____ Vomiting

_____ Caused by deficiency of a digestive enzyme

_____ Only intestinal symptoms

Common Questions and Misconceptions

Section C

WIC staff frequently answers questions from participants and

corrects their misconceptions. Here are a few common ones you are likely to hear.

“The iron in the formula is making my baby constipated.”

Studies have found that formulas with iron do not cause more constipation than formulas without iron. The only condition caused by iron in formulas is darker-colored stools. If an infant is not breastfed or is partially breastfed, iron-fortified infant formula is recommended to prevent iron-deficiency anemia.

Constipation is the regular passage of firm or hard stools with any of the following symptoms: difficulty in the passage of stools, blood in the stools, or abdominal pain. Untreated constipation can result in cuts in the skin of the anus (anal fissures) or stools that are so packed into the anal canal that they can't be expelled voluntarily (impacted stools). *How often an infant has a bowel movement does not define constipation.* (For a summary of usual infant bowel function, see **Table C-1**.)

Poor bowel habits, inadequate amounts of dietary fiber and fluid, and lack of physical activity are the most common causes of constipation in healthy infants (see **Table C-2**). Many infants with special health-care needs have a problem with constipation associated with their disease or disability. Increased or decreased muscle tone or certain medications can cause constipation in infants with health problems.

constipation:
the regular passage of firm or hard stools with symptoms of difficult passage, blood in stools, or abdominal pain

Table C-1 Usual Bowel Function in Infants

Newborn breastfed infants	Newborn bottle-fed infants
<ul style="list-style-type: none">▪ Day 1 — 1 stool▪ Day 2 — 2 stools▪ Day 3 — 3 stools▪ Day 4 — 4 stools▪ 2–5 stools per day for the first several months	<ul style="list-style-type: none">▪ 4–5 per day in first week▪ 2 per day until solids are introduced
Older infants	
<ul style="list-style-type: none">▪ Fewer than 2 stools per day with introduction of solids	

Table C-2 Causes of Constipation in Healthy Infants

Non-nutrition-related causes	Nutrition-related causes
<ul style="list-style-type: none"> ■ Fever ■ Infections or other concurrent illness ■ Sudden major change in routine, such as starting day care ■ Frequent regular use of laxatives (daily/weekly) ■ Medications ■ Lack of activity 	<ul style="list-style-type: none"> ■ Inadequate fiber in the diet ■ Inadequate fluid intake ■ Pica or other non-food ingestion ■ Iron-supplement medication

Some mothers may have had problems with constipation from the prenatal iron or iron supplements they had taken for anemia and so assume it is the same for their baby. Infant formula does not give babies the same amount of iron that mothers take in the iron supplements they needed when they were pregnant.

Resource for parent:

Common infant problems: What about constipation? 1998. Austin: Texas Department of Health. Stock no. 13-121.

See also:

Constipation in infancy and childhood. 2002. *Nutrition Fact Sheet 14*, Texas Department of Health. Stock no. 06-10324.

Iron fortification of infant formulas. 1999. Policy Statement of the American Academy of Pediatrics. *Pediatrics* 104(1): 119-23.

“Should a baby with diarrhea be taken off regular formula and be given lactose-free formula?”

Several studies have shown that discontinuing or diluting regular milk-based formula and changing to a lactose-free or sucrose-free formula is not needed when an infant has *short-term diarrhea*. In cases of more severe diarrhea lasting an average of 25 days or more, lactase and **sucrase** deficiency are likely to occur.

Diarrhea is a change in bowel movement where most of the stools are watery. Stools may also occur more frequently and be larger than usual. Some stools may contain mucus, pus, blood, or large amounts of fat. (Causes of diarrhea are

sucrase:
the digestive enzyme
produced by the body
to break down the
sugar sucrose

detailed in **Table C-3**.)

Infants with acute diarrhea who are not dehydrated should continue to be fed their usual, age-appropriate diets while they have diarrhea. These infants may also need **oral-rehydration solution** to replenish the fluids lost from the diarrhea.

The American Academy of Pediatrics Practice Guidelines recommend that infants with diarrhea who are dehydrated should receive ORS therapy until their dehydration is resolved, and then they should be fed their age-appropriate diets, including breastmilk or full-strength milk-based formula.

“Now that my baby is 6 months old, can I feed him whole cow’s milk?”

Infants should be fed breastmilk or iron-fortified formula for one full year. The AAP recommends that whole cow’s milk is appropriate for most infants after they become 1 year old. Whole cow’s milk does not contain enough iron, linoleic acid, or vitamin E, but it does contain too much protein, sodium, and potassium for an infant to stay healthy.

See also:

The use of whole cow’s milk in infancy. 1992. Policy Statement of the American Academy of Pediatrics. *Pediatrics* 89(6): 1105–09.

diarrhea:

a change in bowel movement which may be more frequent, more watery, or larger than usual

oral-rehydration solution (ORS):

a drink made from a specific recipe of minerals, sugar, and water used to replace the minerals and water lost after dehydration

Table C-3 Causes of Diarrhea in Healthy Infants

Non–nutrition-related	Nutrition-related
<ul style="list-style-type: none"> ■ Fever ■ Infections or other concurrent illness ■ Sudden major change in routine, such as starting or changing day care ■ Frequent use of laxatives ■ Medications 	<ul style="list-style-type: none"> ■ Excess apple or other fruit juice ■ Increase in dietary fiber ■ Pica or other non-food ingestion ■ Food poisoning ■ Milk or other food allergy or intolerance

“Is goat’s milk a good substitute for baby formulas?”

No, goat’s milk is not a good substitute for milk-based formula. Goat’s milk does not have enough folate, vitamin D, iron, and other essential nutrients for infants younger than 1. It also has the same protein structure and the same sugar (lactose) as cow’s milk-based formulas; these can cause the allergic reaction or intolerance that a parent may be trying to resolve.

“Will changing to another formula help my infant’s colic?”

True colic is not caused by something in the infant’s diet, so changing formulas will not help. There is no known cause for colic, and it usually stops on its own by the time the infant is 6 months old.

At least 10 percent of babies who have colic have the same symptoms as babies who have problems with milk protein. It is often hard to tell the difference between colic and a protein allergy or intolerance. If a baby does have a protein intolerance, there usually are additional symptoms such as eczema, diarrhea, bloody or mucous stools, constipation, or vomiting. The symptoms of colic occur frequently in infants, but they rarely occur as a result of an allergic reaction to milk protein. Because the symptoms are so similar, protein hydrolysate formulas have been erroneously recommended for babies who are very fussy and have sleep problems. The AAP states that there is no reason to change to a hydrolysate formula to treat colic, sleeplessness, and irritability.

Doctors use a “rule of three” to determine whether a baby has colic:

1. Crying for more than **3** hours each day.
2. Crying episodes for more than **3** days in one month.
3. Crying episodes continue for at least **3** weeks.
4. Crying episodes begin in the first **3** months of life.

Besides crying, the baby may be hard to calm down, may stiffen her legs and clench her fists while crying, or may pass a lot of gas. The baby may also spit up, vomit, cry during and after a feeding, and not sleep for very long at a time.

Helping the family deal with colic is extremely important because colic is very stressful for the family. Suggest these ideas for calming the infant:

- Burp the baby at pauses during and after a feeding.
- Hold the baby over the mom's (or caregiver's) shoulder or lay the baby on her stomach across mom's knees and gently pat or rub the baby's back.
- Hold the baby upright during a feeding and for at least 10 to 15 minutes after the feeding.

See also:

Common infant problems: What about colic? 2002. Texas Department of Health. Stock no. 13-120.

Hypoallergenic infant formulas. 2000. Policy statement of the American Academy of Pediatrics. *Pediatrics* 106(2): 346–49.

“My baby throws up every formula I give her.”

The expression “throws up” is very common and may describe something that is either harmless but alarming and inconvenient, or something that is serious and needs immediate medical attention. “Throwing up” can describe spitting up, vomiting, or gastroesophageal reflux. Often, parents become alarmed and feel that their babies are vomiting a large amount of formula or breastmilk when the actual amount is very small. If an infant is growing well, the chances of serious reflux are very small.

Gastroesophageal reflux is a condition in which acidic stomach contents flow back up the esophagus. It happens when the ring of muscles that separates the top of the stomach from the esophagus is not working properly. In most cases, GER resolves without intervention by the age of 8 to 18 months. The most improvement is noted between the ages of 8 and 10 months when the infant sits upright and eats more solid foods. GER can range from mild spitting up to a severe form causing aspiration, failure to thrive, lung disease, or inflammation of the esophagus.

Spitting up is the mildest form of GER. Growth and health are not affected, and symptoms improve with time. Spitting up can be a result of —

- **Overfeeding:**

spitting up:
a mild form of gastro-
esophageal reflux that
does not affect growth
or health

gastroesophageal-reflux disease (GERD):
a disease resulting from gastroesophageal reflux that includes poor growth, pain, or respiratory illness

hypotonia:
low skeletal muscle tone, often called “floppy”

hypertonia:
high skeletal muscle tone, muscle tightness

Many young infants cannot consume large volumes of milk or food at one time. If the infant is overweight (weight-for-length at or above the 90th percentile), it may indicate overfeeding.

■ ***Swallowing air before or during feeding:***

Start feeding before the infant becomes frantic and is crying; position the bottle so that the nipple is filled with milk; burp the baby frequently.

■ ***Excessive stimulation:***

Create a calm, relaxed feeding environment.

Gastroesophageal-reflux disease is a serious problem that affects growth, health, or both. GERD in infants is GER complicated by one or more of the following:

- Malnutrition from frequent regurgitation, as shown by growth failure.
- Heartburn-like pain from GER, which may cause infants to limit their food intake or refuse to eat.
- Respiratory illness, which is caused by the refluxed material getting into the infant’s lungs.

Very few otherwise healthy infants have GERD. It is more common in premature infants and infants with neuromuscular disorders — e.g., cerebral palsy, muscular dystrophy, **hypotonia** (low muscle tone), or **hypertonia** (high muscle tone). GERD can occasionally be caused by stress resulting from problems in the relationship between the infant and caregiver or any other type of environmental stress. Emotional stress affects the movement in the gastrointestinal tract.

Treatment of GERD must be prescribed by a doctor and usually consists of:

- ***Smaller and more frequent feedings*** — If smaller feedings do not help, the doctor may prescribe a concentrated formula to give the infant adequate nutrients with a smaller amount of formula. Tube feedings may be required in extreme cases.
- ***Positioning*** — This recommendation should be made by the baby’s doctor and *not* by WIC staff. Keeping babies in

a more upright position all the time helps with GER. The AAP recommends that all healthy infants sleep on their back because sleeping on their stomach has been associated with sudden infant-death syndrome (SIDS). Doctors often do recommend that babies with GER sleep on their stomach with the head of their crib elevated.

- **Changing formula** — Unless vomiting is due to allergy, changing formulas is not usually effective. In severe cases, changing to **elemental formulas** or to formulas that form smaller curds in the stomach may be effective.
- **Thickening formula** — Adding cereal to formula is a traditional treatment which is controversial because it may reduce vomiting but not reflux. Cereal can add unwanted calories, leading to obesity, and it can dilute the other nutrients in formula. Enfamil AR LIPIL is a standard cow's milk-based formula that thickens when it reaches the stomach. It is not known if it reduces reflux because no studies have been performed to test this. If an infant is given medication that decreases stomach acid, the Enfamil AR LIPIL formula will not thicken, so regular formula thickened with infant cereal would be more effective.
- **Medication** — Medications may be given to increase the emptying of the stomach or to decrease or neutralize stomach acid.
- **Surgery** — An infant with neurological problems is less likely to respond to medical management and more likely to require surgery.
- **Other dietary measures** — Some babies must avoid high-acid foods such as orange juice, tomato products, and carbonated beverages.
- **Psychological counseling** — Psychological counseling may be needed to resolve the problems between the infant and caregiver if stress is contributing to “nervous vomiting.”

Vomiting is the forceful expulsion of the stomach contents, unlike the passive movement of GER. Vomiting can be related to:

elemental formulas:
formulas containing
predigested nutrients
such as amino acids
and medium-chain
triglycerides

vomiting:
the forceful expulsion
of the contents of the
stomach

Section C

- illness, which may be accompanied by other symptoms such as fever, diarrhea, dehydration, and electrolyte imbalance;
- allergy or intolerance, which is usually accompanied by diarrhea, rash, or respiratory symptoms such as wheezing or congestion;
- inborn errors of metabolism, which are usually accompanied by failure to thrive, neurologic symptoms, seizures, or developmental delay; or
- structural problems in the gastrointestinal tract.

“Milk makes me sick if I drink it, and the same thing is happening to my baby.”

It is very rare that a baby has the same problems with milk that an adult does. Many adults are lactase deficient with mild to severe symptoms, but the problems that adults have with milk did not start until they were past infancy and into their preschool years.

The sugar in breastmilk is lactose, which is the same sugar in milk-based formula. There have been very few substantiated cases in the whole world of an infant born without lactase, the digestive enzyme that breaks down lactose. Lactose is important to a baby's health because it helps the baby use important minerals such as calcium, magnesium, and zinc. Some lactose ferments in the intestines and promotes the growth of good bacteria. These good bacteria help the baby's health by creating an environment that keeps disease-causing bacteria from growing.

Self-Test Questions — Section C: Common Questions and Misconceptions

1. *Fill in the blanks.*

Constipation is the regular passage of firm or hard stools with any of the following symptoms: _____, _____, or _____.

2. *Fill in the blanks.*

The most common causes of constipation in healthy infants are inadequate amounts of _____ and _____, and/or a lack of _____.

3. *Fill in the blanks.*

In treating short-term diarrhea, there is no proof that you need to use _____ or _____ formula, discontinue _____ formula, or _____ infant formula.

4. *List the two recommendations from the AAP guidelines for feeding infants with diarrhea:*

A. _____

B. _____

5. *Fill in the blanks.*

Children who are fed whole cow's milk after they turn 6 months old do not get enough _____, _____, and _____, while they get too much _____, _____, and _____.

6. *Fill in the blanks.*

Goat's milk has the same _____ and _____ as cow's milk-based formulas, so it can cause the same allergic reactions. Goat's milk also does not have enough _____, _____, and _____ for infants younger than 1 year old.

7. *Describe the "rule of three" that doctors use to determine whether a baby has colic.*

8. Mark the following statements **TRUE** or **FALSE**.

- _____ There is no known cause for colic.
- _____ Colic usually stops on its own by the time an infant is 6 months old.
- _____ Any time a baby spits up, it is an abnormal and dangerous situation.
- _____ From 60 percent to 80 percent of children with colic will still have symptoms by the time they are 8 years old.

9. *Fill in the blanks.* Most cases of simple GER resolve with no intervention by the time the infant is ____ to ____ months old. The most improvement is seen between ____ and ____ months of age when the infant _____ and eats _____.

10. *Check all that apply.* Physicians often treat GERD by:

- ____ a. changing the baby's position during and after feeding.
- ____ b. thickening formula with cereal.
- ____ c. recommending the infant get small, frequent feedings.

11. *List three answers you can give to the mother who tells you, "Milk makes me sick when I drink it, and it is making my baby sick, too."*

- a. _____

- b. _____

- c. _____
